Saskatchewan Agriculture and Food

FARM FACTS

ASCOCHYTA BLIGHT OF CHICKPEA

Chickpea (*Cicer arietinum*) is a pulse crop and can fix a portion of its nitrogen requirement. It also represents an excellent opportunity for producers to diversify their cereal crop rotation by including a broadleaf crop that provides good economic returns. Chickpea is best adapted to the brown and dark brown soil zones of southern Saskatchewan and Alberta, where production problems of seedling blight, late maturity and ascochyta blight are less common. There were approximately 700,000 acres under chickpea production in Western Canada in 2000 and acreage continues to expand.

Ascochyta blight is the most damaging disease of chickpea in Western Canada. When conditions are favourable for this disease, even the most resistant varieties can experience yield losses in excess of 70 per cent. Pulse disease research and breeding efforts are ongoing to better understand disease development and spread and to provide information on management. Use of disease-free seed, seed treatments, a four-year crop rotation, partially resistant varieties and foliar fungicides can minimize these losses.

ASCOCHYTA BLIGHT DISEASE CYCLE (Figure 1)

Pathogen Survival. Ascochyta blight is caused by the fungal pathogen *Ascochyta rabiei*. Infected chickpea seed and residue are the primary means by which this pathogen overwinters. Planting infected seed increases the chance that the emerging seedling will be infected, as there is a high rate of seed-to-seedling transfer of the pathogen. Once the pathogen has been brought above the soil surface, it is more likely to spread to surrounding plants. In addition to overwintering in the seed, the pathogen can survive and produce spores on infested chickpea residue for at least two years, or until the residue breaks down (Figure 1 a.).

Spore Production. There are two different spore stages that can develop on overwintered chickpea residue. The most common spores are conidia (Figure 1 b), which are produced in a fruiting body called a pycnidium. Conidia are exuded from pycnidia in a sticky mass and require rain-splash to spread them to surrounding plants. Conidia are a result of asexual reproduction of the pathogen. Pycnidia and conidia develop readily under humid conditions, and are produced throughout most of the growing season.

Recent research in Saskatchewan indicates that a second spore stage can occur on overwintered chickpea residue. These spores are called ascospores and are produced within a fruiting body called a pseudothecium (Figure 1 c). This spore stage is a result of sexual reproduction that requires the presence of two different mating types of the pathogen. These different mating types have been identified in Saskatchewan. However, the frequency of ascospore development has not yet been determined. Ascospores can be spread by wind for several miles and thus may become an important factor in developing new infections. Since ascospores are produced by sexual recombination, the pathogen population is genetically diverse, making breeding for resistant varieties difficult.

Symptom Development. Symptoms can develop on any above-ground plant part and, under high disease pressure, may be observed as early as the seedling stage. Disease lesions begin as small, light brown spots that quickly expand under humid conditions. Lesions that develop on leaves are typically light brown or tan in colour and develop a dark brown margin (Figure 1 d). Lesions on stems are elongated and dark brown, with a dark margin (Figure 1 e). Lesions that develop on pods are usually circular (Figure 1 g).

Small, black, round pycnidia develop within the lesions (Figure 1 f). Pycnidia are often visible to the naked eye, as they are about the size of a ballpoint pen tip, but a magnifying glass can help confirm their presence.

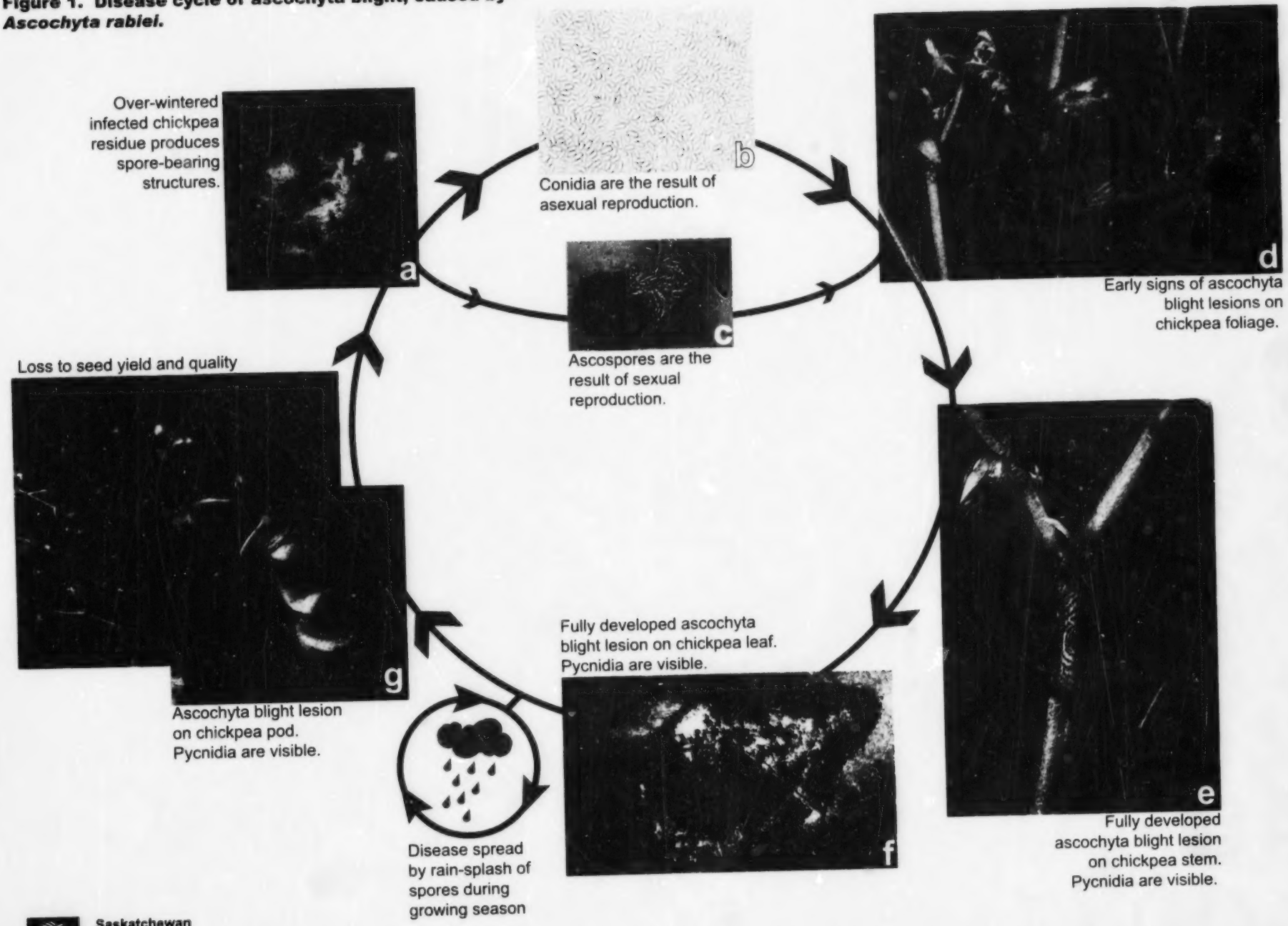
Pycnidia may form in concentric rings, giving a bull's-eye appearance to some lesions (Figures e and g). Under humid conditions, conidia (Figure 1 b) ooze from mature pycnidia and are spread by rain-splash to surrounding plants.

Disease Spread. The majority of in-season infection is a result of rain-splash of conidia. Under humid conditions, the conidia ooze out of mature pycnidia and are spread to surrounding plants by splashing rain. The movement of the infection can be observed as spreading circular patches of dying and dead plants in the field.

Warm (20-25°C), rainy conditions are most conducive to disease increase. The cycle of infection and spore development is rapid under these conditions. For instance, infection can occur within 24 hours, new symptoms can develop after four days, and new spores are formed in only five to six days. This multiple cycle of infection can result in rapid disease increase within the chickpea crop.

Crop Loss. Severely infected leaves wilt and die. Stem lesions cause girdling of the stem and lead to stem breakage. If the main stem

Figure 1. Disease cycle of ascochyta blight, caused by *Ascochyta rabiei*.


Over-wintered infected chickpea residue produces spore-bearing structures.
a
b
Conidia are the result of asexual reproduction.
c
Ascospores are the result of sexual reproduction.
d
Early signs of ascochyta blight lesions on chickpea foliage.
e
Fully developed ascochyta blight lesion on chickpea stem. Pycnidia are visible.
f
Fully developed ascochyta blight lesion on chickpea leaf. Pycnidia are visible.
Disease spread by rain-splash of spores during growing season
g
Loss to seed yield and quality
Ascochyta blight lesion on chickpea pod. Pycnidia are visible.

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is girdled at the base, the whole plant dies. Pod fill on severely infected plants is reduced, or may be completely halted. The pathogen can infect developing seed by penetrating the seed coat into the seed cotyledons. Infected seed may be shriveled, spotted or discoloured.

Severity of infection will depend on weather conditions and agronomic factors. The most severe infections are expected to occur during periods of frequent rainfall, in regions where infested chickpea residue is prevalent, or in fields where infected seed was planted.

Any additional stress on the chickpea crop may have an impact on ascochyta blight development. Stresses include such things as delayed emergence, herbicide injury, wind damage or hail. For example, hail can predispose the crop to ascochyta blight as it causes wound sites for the spores to enter, creates another rain-splash event during which spores can spread, and impedes plant development. However, as there are many variables involved, correlating the amount of disease increase with a particular stress factor is difficult.

DISEASE MANAGEMENT

Successful disease management requires planning well in advance. Regular scouting and early identification of disease symptoms are necessary. It is recommended that growers choose an integrated approach that incorporates a number of good management practices to minimize risk of ascochyta blight.

Disease-Free Seed and Seed Treatment. Planting seed that is free of ascochyta blight is the primary means to limit the introduction of the pathogen into a field and prevent early establishment of disease. It is recommended to have seed tested at an accredited laboratory to assess the level of seed-borne ascochyta and other pathogens. Testing for germination is also necessary as it serves as an indication of overall seed quality.

It is recommended to plant seed that is as close to zero per cent seed-borne ascochyta infection as possible. Remember that a seed sample tested at a laboratory is only a small representation of the larger seed lot. If ascochyta blight was evident in the field the previous season, some infection is likely to be present, even if the seed test does not detect ascochyta. Since there is a high rate of seed-to-seedling transmission of the pathogen, even a small amount of infected seed can result in significant seedling infection in the field. For example, with a 0.1 per cent ascochyta-infected seed lot (one infected seed in 1000 seeds), potentially 175 infected seedlings per acre could result if planting density is three to four plants/ft^2.

When ascochyta-free seed is not available, seed treatment can help reduce the movement of the pathogen from infected seed to seedling. Even with seed treatment, planting seed with low ascochyta-infection levels is advised, as seed treatments cannot eliminate disease completely.

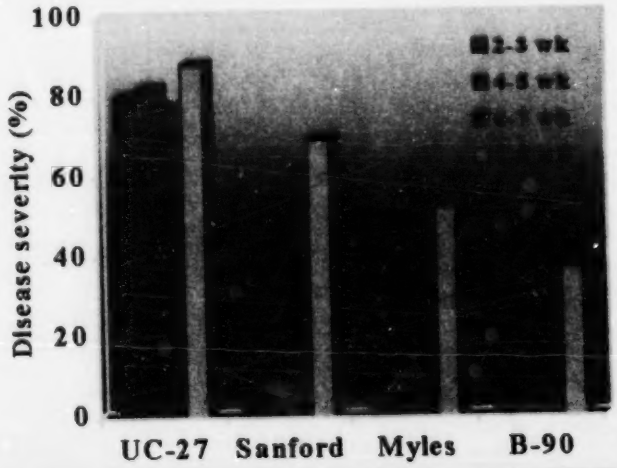
CROWN® seed treatment fungicide was given temporary registration in 2001 for control of seed-borne ascochyta in chickpea. APRON FL® is registered to protect against seed rot and seedling blight caused by species of *Pythium* and *Phytophthora* but is not effective against seed-borne ascochyta. Refer to Saskatchewan Agriculture and Food's *Guide to Crop Protection* for information about registered seed treatments and the diseases they control.

Crop Rotation and Tillage. A crop rotation that includes a break between susceptible crops allows time for the decomposition of residue on which the pathogen survives. Hence, a minimum of three years is recommended between chickpea crops. If possible, crops should not be grown next to fields that were heavily infested with ascochyta blight in the previous year. Burying infested residue hastens decomposition and reduces its potential to produce spores. This pathogen can survive for more than two years in infected chickpea residue left on the soil surface, but dies quicker when buried.

Chickpea is the main host of *Ascochyta rabiei*. Lentil, pea, fababean and chickpea all suffer from diseases known as ascochyta blight; however, each crop is affected by a different species of *Ascochyta*. For example, the lentil pathogen does not attack chickpea, and the chickpea pathogen does not attack lentil. However, recent research indicates that certain isolates of the chickpea *A. rabiei* pathogen can infect field pea.

Resistant Varieties. Adapted varieties with partial resistance are available. Varieties include Sanford, Dwelley, Myles, B 90 (Amit), CDC Yuma, CDC Xena, CDC Diva, Evans, CDC Anna, CDC Nika, CDC Desiray and CDC Chico. These varieties have good resistance as young plants, but become much more susceptible to infection at flowering (Figure 2). When conditions favouring disease development occur, such as frequent showers and high humidity, even the most resistant varieties can suffer severe losses in seed yield and quality. Field observations have indicated that leaf structure

Figure 2. Older plants (6-9 weeks after seeding) of the varieties Sanford, Myles and B-90 are more susceptible than seedlings. This difference is not evident in highly susceptible varieties such as UC-27. Source: Agriculture and Agri-Food Canada, Saskatoon.



may also affect resistance to ascochyta blight. For example, varieties with a fern-like leaf structure appear to have delayed and reduced lesion development compared to varieties with a unifoliate leaf structure. For information on current recommended chickpea varieties, refer to Saskatchewan Agriculture and Food's *Varieties of Grain Crops*.

Scouting and Foliar Fungicides. Ascochyta blight symptoms in chickpea must be accurately diagnosed to distinguish them from environmental damage or other diseases, otherwise control practices may increase costs with no benefit. To confirm the presence of ascochyta blight, look for brown or tan coloured lesions forming within the leaf area or on the stem. Discolouration of just the leaf margins or entire death of lower leaves is not likely ascochyta blight.

Early identification of ascochyta blight is critical, as it allows time for a decision to be made before the disease becomes well established. Start monitoring fields at the pre-bloom stage (early to mid-June) and continue throughout flowering. If it is not feasible to walk all chickpea crops, start scouting in those fields that are at greater risk. Include fields that were planted with ascochyta-infected seed (even if a seed treatment was used), fields that had chickpea in the rotation in the previous two years, or fields located next to infected chickpea residue. If infection sites are found early, spot treating with a fungicide may prevent spread to the rest of the field and save money by reducing the number of fungicide applications.

Research has determined that one or more applications of a foliar fungicide during flowering, or even early podding, can increase seed yield and quality (Figure 3). A foliar fungicide application is not cost-effective when ascochyta blight severity is very low; however, if conditions are humid with frequent precipitation, a minimal amount of disease can increase very rapidly. Therefore, current recommendations are to apply BRAVO 500* at the first sign of ascochyta blight lesions on the stem or at early flowering if lesions are present on the leaves. Timely application of fungicide is especially important if the forecast calls for rain.

BRAVO 500* is the only foliar fungicide currently registered for control of ascochyta blight in chickpea. BRAVO 500* is a protectant fungicide that will reduce the future spread of disease, but will not restore plant material already infected. Other fungicides with systemic and curative activity are being studied. Refer to Saskatchewan Agriculture and Food's *Guide to Crop Protection* for information on registered foliar fungicides.

Good Agronomics. Following sound agronomic practices help ensure that a chickpea crop is able to tolerate stresses caused by pests or the environment. Good agronomic practices include proper rates, depth and timing of seeding, fertilization, *Rhizobium* inoculation and weed control. Do not plant chickpea in areas for which current varieties are not adapted (i.e. outside the brown and dark brown soil zones). For more information, refer to Saskatchewan Agriculture and Food's publication, *Chickpea in Saskatchewan*, and The Saskatchewan Pulse Growers' *Pulse Production Manual*.

ADDITIONAL INFORMATION SOURCES

- Saskatchewan Agriculture and Food's Internet website at: www.agr.sk.ca (search for information on Pulse Diseases)
- Pulse Production Manual, The Saskatchewan Pulse Growers

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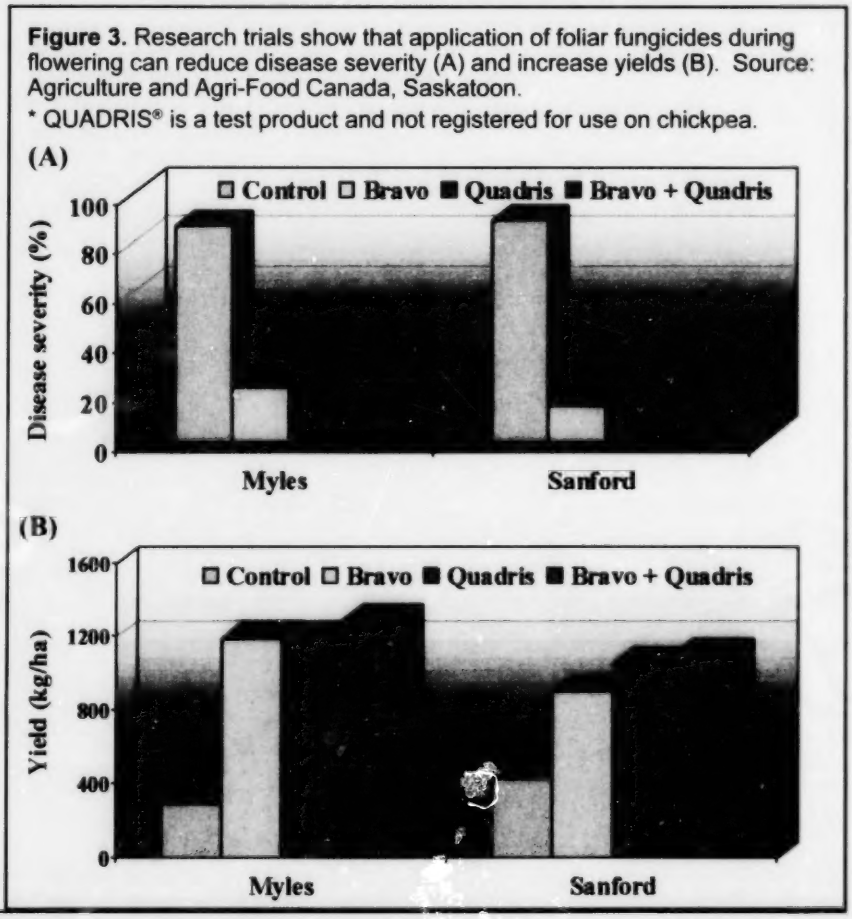

Figure 3. Research trials show that application of foliar fungicides during flowering can reduce disease severity (A) and increase yields (B). Source: Agriculture and Agri-Food Canada, Saskatoon.
* QUADRIS® is a test product and not registered for use on chickpea.